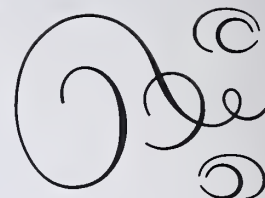


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Combat Crew

avalanche air command
MARCH 1983





RESPONSIBILITY OF SUPERVISORS

“Once again, it’s back to basics.”

Those words are always on the lips of supervisors when something goes wrong. Recent incidents remind us again that when we fail to practice the basics, we invite trouble. Outstanding capabilities and excellent job knowledge are of little help when we do not adhere to the basics and make them a part of our daily work habits. The complexities of our work and the turnover within the work force necessitate adherence to a few fundamentals – always. Let’s review some of these fundamentals. Keep in mind that these principles may seem to be the obvious, but remember, what happens on the flight line, in the silo and in the shop determines how well we do our mission.

KNOW YOUR JOB. Each individual has to have a specific and practical understanding of his or her piece of the mission. You may recall earlier days when each person had his job description clearly displayed near the work area. That was useful but perhaps seldom read. What is needed is a clear understanding by each individual of his job and responsibilities if we hope to keep our daily activities on track. Each of us must recognize that we are fully accountable.

KNOW THE PEOPLE AROUND YOU. Knowing the strengths and weaknesses of the people around you is a key to being an effective worker. As a supervisor, it is absolutely essential that you know the capabilities of your people. A simple test is to ask the question, “Would you treat your people as you do if you owned the shop and signed the pay checks?” You might also consider how much effort you exert in insuring that each person is as proficient in individual job skills as he is expected to be. Would you do anything different if you were responsible for a profit and loss statement?

DETERMINE THE RESOURCES REQUIRED. Know the resources – people and material within the organization. If you know what is required and available, you can prioritize your attention in correcting the shortfalls. It is much easier to work a few problems at a time than it is to try to solve everything at once. The successful worker and supervisor knows what is available, what is most important at any particular time and how to get the system to provide needed additional resources.

KNOW WHERE YOU STAND. Each job has certain factors which describe the health and performance of the work center. These factors should be as objective as possible, related directly to the mission of the organization and should tell it like it is. In assessing how well you are doing, few “we are outstanding” assumptions should be made. A “no nonsense” look at all available indicators should include the results of inspections, accidents, incidents, staff assistance visits and your personal assessment of how well things are going. The final step is to recognize things as they really are, and if you have problems, do something about them including asking for help if the solutions are not within your capability. The key to solving a problem is first to recognize and acknowledge that it exists.

KNOW YOUR SOFT SPOTS. Sort out your concerns, define your real problems and prioritize them so you can attack them in some logical manner. What may appear to be a falling sky may actually be one or two soft spots that can be corrected once they are properly defined and when necessary brought to the attention of the right people. Time after time, subsequent to accidents and/or unsatisfactory inspection results, the root causes of problems are resolved.



Lt Gen George D. Miller, Vice Commander in Chief, SAC

Earlier identification and resolution could have avoided embarrassment and more costly solutions.

DO IT BETTER. As you consider basic factors and fundamentals to good job effectiveness and supervisory responsibility, also consider what you can do to improve your effectiveness. Many times a fresh perspective will stimulate excellent ideas toward removal of a problem you have become accustomed to living with. A better idea usually exists in each of us if we can bring it out at the right time and place.

WE'RE OKAY. We need to approach our work positively by recognizing situations for what they are. We have good people in the Air Force and SAC. They want to do a good job and will if we train them properly, teach them the job skills they need, supervise them as we should, provide them with the quality of work-life and resources they need – and finally, motivate them with an understanding of the importance of their work. The results of our daily work can provide the American people with the most professional and productive Air Force possible with available resources. We will be okay so long as we remember that the basics must be a part of our work habits, every day. ★ ★ ★

MARCH 1983

Combat Crew

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COMMANDER IN CHIEF, SAC

BRIG GEN JACK K. FARRIS
INSPECTOR GENERAL

COL RICHARD A. PATRICK
DIRECTOR OF SAFETY

STAFF

EDITOR
CAPT. RANDY LAUTERBACH

ASSOCIATE EDITOR
KEN MAASSEN

ART EDITOR
SGT. STEVE PARRISH

EDITORIAL ASSISTANT
M. J. ABBOUD

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ON OUR COVER

According to the saying, March comes in like a lion and out like a lamb. This is also the time of year when the thunderstorm hazard is on the increase. For more on this subject, see pages 10 and 18.

SACRP 127-1 VOL. XXXIII No. 3 MARCH 1983

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SAR SATELLITE AIDS RESCUERS

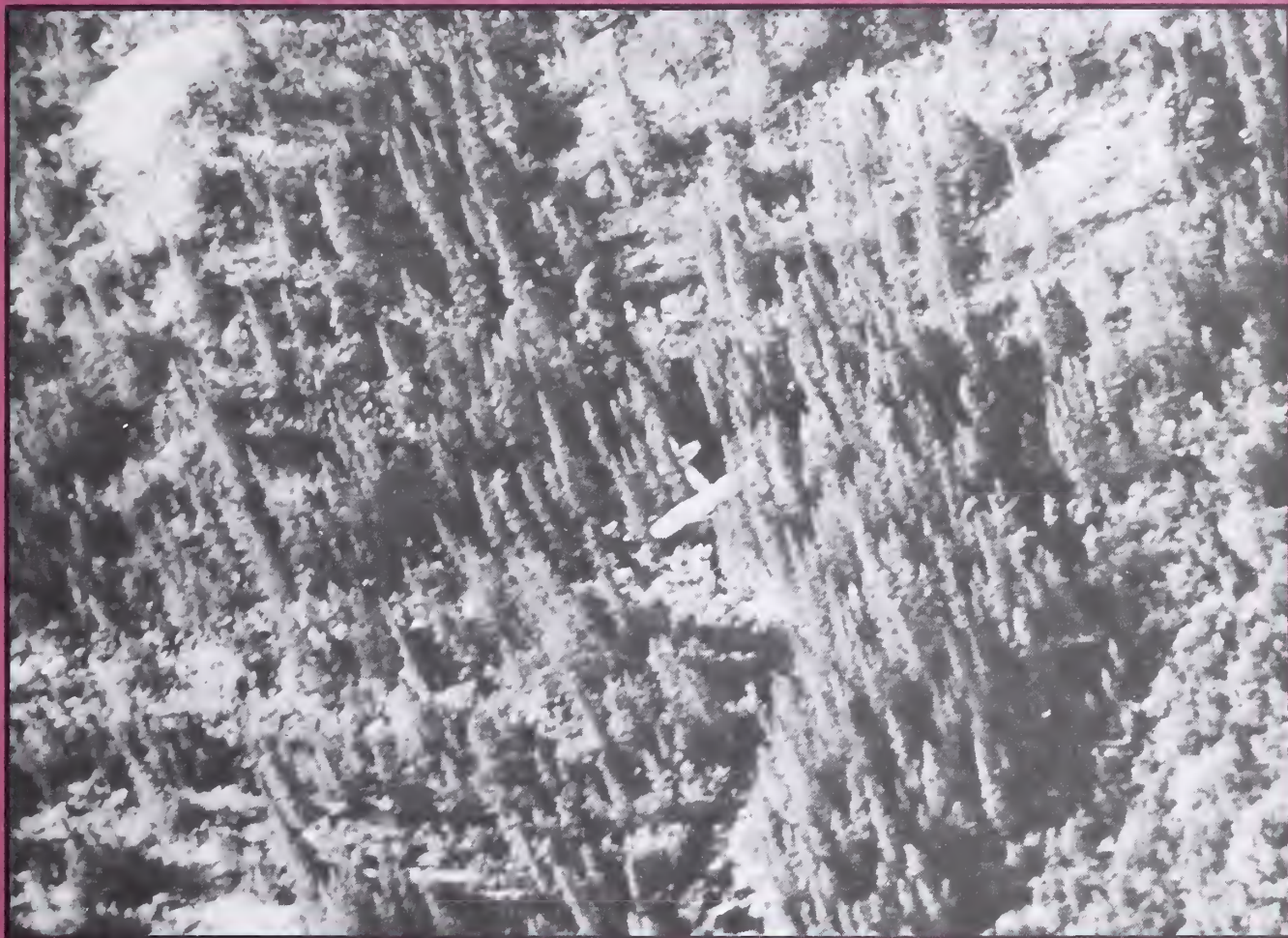
*Reprinted with permission from the Dec 1982
issue of the ICAO Bulletin
Charles D. LaFond
Editor, ICAO Bulletin (Montreal)*

**First results of COSPAS-derived
accident-location data
are encouraging.**

**Accuracies are about as expected; reductions
in search time already have been noted in
four Canadian and U.S. SAR operations . . .**



A COSPAS/SARSAT Local User Terminal (LUT) tracks the SAR-repeater-equipped satellite, receives the relayed ELBA distress signals and then calculates beacon location. Shown is the Canadian ground station at Ottawa.



This photo reveals the problem of visually locating a downed aircraft – it tends to merge into its surroundings. Shown is the Cessna 172 that went down in Canada on 9 September 1982. The first high level aircraft search, without COSPAS information, was unsuccessful.

The first search and rescue (SAR) repeater inserted into Earth orbit aboard a satellite on 30 June 1982, already has contributed to four SAR operations and the saving of seven lives.

The satellite is Cosmos 1383, launched by the Soviet Union into a roughly 1,000-kilometre circum-polar orbit. It carries a COSPAS-1 (Cosmos Rescue) repeater package developed by the USSR Ministry of Merchant Marine (Morflot). This is the first of a series of experimental units to be orbited for the relay of signals emitted by emergency locator transmitters carried on aircraft and ships.

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A joint development program, it involves the COSPAS repeaters built by the USSR and SARSAT (SAR Satellite Aided Tracking) repeaters to be monitored by Canadian, French and United States ground stations. Two other nations, Norway and the United Kingdom, will participate in subsequent system evaluations.

Under the present schedule, the first SARSAT-equipped satellite will be launched in February 1983 by the U.S. National Aeronautics and Space Administration. The repeater package will be carried aloft in a National Oceanic and Atmospheric Administration weather satellite, NOAA-E.

A joint technical checkout by all four participating nations began on 1 September; a 12-18 month period will be devoted to tests designed to evaluate system effectiveness in locating downed aircraft or vessels in distress – rapidly and accurately.

Accuracy to be Improved

The experimental COSPAS/SARSAT system makes use of signals (121.5 and 243 MHz) from existing aircraft Emergency Location Beacons – Aircraft (ELBAs) and emergency position-indicating radio beacons (EPIRBs) used in marine vessels. The satellite re-

lays these distress signals to a ground station known as a Local User Terminal (LUT) where the origin of the distress call is calculated to within about 30 km. The ground station then relays this information to a Mission Control Centre (MCC) which alerts the nearest Rescue Coordination Center (RCC) for action by search and rescue aircraft or ships.

There are at present seven ground stations to receive COSPAS/SARSAT relayed signals: three in the U.S., one in Canada, two in the USSR, and one in France.

By immediately identifying a small area from which a distress call is being sent, the SARSAT system is expected to reduce the time taken to detect distress calls, normally reported by overflying aircraft or by ships. Also, search time in response to a reported distress call should be minimized because rescue aircraft or ships will be sent direct to the area of the distress.

The experimental SARSAT system should thus help save lives and reduce the risk of the rescue forces who often operate under severe and dangerous conditions. For a distress call to be heard by the satellite, aircraft and ships in distress must possess an ELBA or EPIRB. SAR forces in many nations now encourage the carriage of these beacons for this reason.

New ELBA/EPIRBs under development will provide a number of improvements over the present beacons. Operating at 406 MHz, such units will provide a location accuracy to better than 5 km, permit worldwide coverage from any LUT and include a unique owner identification and certain distress information.

Seven lives saved

COSPAS transmissions so far have been instrumental in assisting four SAR operations and the saving of seven lives, two downed aircraft in Canada and one in the

United States plus a capsized boat in the Atlantic Ocean, 550 km off the U.S. New England coast.

The first occurred on 9 September, RCC Victoria was alerted by a Flight Services Station that a Cessna 172 on a VFR flight through British Columbia, Canada, was overdue. The chartered aircraft carried three persons who were continuing the search for the son of one participant who had disappeared on a similar flight on 19 July. (This previous incident, after the fruitless expenditure of over 1780 flying hours, had been placed on "reduced status" by Canadian SAR forces on 10 August.)

It was determined later that the Cessna 172 had stalled as the pilot flew up a blind valley. The crash site was a heavily forested (15-metre trees), over 1-km long valley surrounded by 2,100-2,400 m high mountains. All parties on board survived, but each suffered broken bones and multiple scratches and bruises.

The ELBA antenna was broken off on impact. Recognizing their plight, the survivors removed the ELBA and carried it to the top of a hill in an attempt to extend its transmitting range. The broken antenna was stuck straight into the ELBA connector slot.

Search aircraft failed to locate the crash site visually or even to pick up the ELBA signal; thus, RCC Victoria contacted RCC Trenton to initiate monitoring of the next appropriate COSPAS satellite pass over the crash area. The Ottawa SARSAT LUT tracked Cosmos 1383 and identified from its transmissions two probable crash-site locations in the search area. After reprocessing one was determined to be a sideband; the more probable location was passed on to RCC Victoria.

A SAR Buffalo aircraft was dispatched and it eventually picked up the ELBA signal while circling the area at high altitude. A parachute-rescue team was deployed, survivors were treated and then airlifted out by SAR helicopter.

It should be noted that the crash site was 50 km north of the intended flight route. RCC Victoria estimates that at least 3-4 more days probably would have been required to find the survivors without the satellite information. Moreover, the pilot possibly might not have survived. As it was, however, medical aid reached the site 26 hours after the crash.

Again in Canada, on 29 September, there was another incident. This involved a Piper Cherokee charter aeroplane carrying a single passenger to a hunting camp site near Casey, Quebec. RCC Trenton received a Mayday report, with vague position data from the Montreal area control center.

A SAR Buffalo was sent to the area to perform an ELBA and visual search. Meanwhile, however, more definitive ELBA location data were obtained from the COSPAS satellite; the crash site was quickly found and para-rescue personnel were deployed. The pilot was deceased, the passenger injured. Total time: less than 6 hours to the recovery of the survivor.

On September 30, U.S. SAR teams were directed quickly by COSPAS location information to an air crash site in New Mexico, only to find both aircraft occupants dead on their arrival. Nevertheless, the satellite-derived crash coordinates greatly reduced search time, according to NASA officials in Washington, D.C.

Finally, COSPAS was instrumental in locating the trimaran *Gonzo*, which had capsized off the coast of Maine in very rough seas on the evening of 10 October.

The first report of a possible problem came from TWA Flight 900, on a scheduled flight from New York to Lisbon and Barcelona. Having picked up EPIRB signals, it radioed the coordinates of the possible beacon site to the FAA's New York Oceanic Center. RCC Scott (a U.S. Air Force base in Illinois) was alerted and it then

requested SARSAT-derived coordinates. These were obtained around midnight as the COSPAS satellite passed over the EPIRB area, greatly assisting in localizing the beacon source, according to a U.S. Coast Guard report of the incident.

A Coast Guard C-130 transport aircraft was dispatched from Elizabeth City, N.C., which subse-

quently sighted the overturned trimaran with three survivors clinging to the hull. This was around 0648 on 11 October.

Communications were maintained with one survivor who had a hand-held VHF transceiver. All three men wore survival suits and were in good physical condition. Winds were at 35 knots, seas approaching 5 meters.

Running low on fuel, the C-130 was relieved by a Canadian P-3 patrol aircraft. Soon thereafter, the Coast Guard Cutter Vigorous and a tanker, the California Getty, reached the site. The Getty used its 265-m length to create a lee in the heavy seas while the *Vigorous* crew one by one hauled each survivor out of the sea by "horse collar" and heaving lines.

Close-up of the Cessna crash site. The nose of the aeroplane is on the ground, the tail in the trees. Search crews concluded that without early recovery all crash victims probably would have gone into shock; the pilot, without early medical attention, may not have survived.



“For The Want Of The Nail”



1Lt Roy E. Curtis
91st SMW, Minot AFB

The story goes that *“for the want of the nail loseth the shoe, the loss of the shoe troubles the horse, the horse endangerth the rider, the rider breaking his neck molests the company so far as to hazard the whole army”* (Thomas Adams, 1629). In our world of high technology, a little too much oil ruins an engine, a bolt ruins an aircraft tire, and improperly torqued equipment causes system degradates. We cannot afford to neglect *“attention to detail.”*

When we consider the Soviet military strength it becomes paramount that we maintain our aircraft and missile fleets at the highest state of readiness. However, there seems to be a trend in an

increase of minor discrepancies which are left undetected by maintenance personnel or at least not corrected. Numerous quality control inspection reports of facilities and equipment pass over my desk. The reports are thorough and usually contain one or two major discrepancies and 15 to 25 minor discrepancies. Before the QC inspection is made, three of four “teams” of maintenance personnel (not counting the original team that caused the problem) have had the opportunity to detect and correct the discrepancies, but who for some reason didn’t correct them.

Continued on page 24



THERE I WAS . . .

*Capt Michael E. Camp
22d AREFW, March AFB*

. . . 28,000 feet, three miles in trail, in a six ship cell of B-52s and KC-135s. The Buffs were headed for Europe so the offloads were unusually large. The tankers were round robin sorties with one notable exception: us!

We were to drop into a northern base after A/R and retrieve a numbered air force team and return them to home drome. No sweat. So it's two o'clock Saturday morning, darker than a well digger's destination and the heating system in the boom pod was doing its level best to preserve me freeze-dried. Not to worry, I've done this lots of times.

As an old head boomer, with a few hundred hours, these conditions were nothing new, just another day. (Boy, my hands are cold, sure wish I'd worn my gloves . . .) "What's that Co . . . He's got his gas?" (Great, now I can punch him off and get my hands and feet warm . . .) . . . (C'mon Lead, quit talking for a minute so I can do my thing . . .) (. . . Boy, I wish he'd shut up, he's been talking forever . . .) (Well, I'll just punch this guy off now and talk to him later . . . Thanks a lot, lead . . .) (Oh, Oh . . . I've got a disconnect light, but the pole is still in the hole . . .) "Uh . . . bomber three, tanker three has negative disconnect . . . hold your position." (Darn, he can't hear me . . .) (Hey . . . where the heck is he going?) "Bomber three . . . hold your position . . . tanker three has negative disconnect . . . Wait!" (Oh, *! . . .) "No

pilot, everything's okay back here, just a brute force, we still have a nozzle."

Lead never did get off the frequency, he just went right on talking, about what I don't remember. Bomber three had a "disconnect light," so he thought that everything was okay . . . until he banked away!

By the time we got home I had calmed down enough that my hands had quit shaking. That was the worst brute force disconnect I've ever heard of where the boom remained intact. But since it did remain intact, no harm done . . . right? WRONG! Nearly \$270,000 worth of harm.

Yoke and trunion assembly cracked clean through, numerous popped rivets and lots of cables, hoses and lines, bent, stretched and generally abused. Not to mention one very perturbed DCM. I consider myself very lucky though it didn't cost nearly as much as it could have, and we're all still around to talk about it, so, all things considered, we got off rather easily.

Boomers, remember Murphy's third law, "If it can go wrong, it will." Pilots and others, remember that the frequency belongs to the boomer during A/R. If you have to say something important, keep it short and to the point. Also, always back straight off of the boom, never try to twist it off. Keep it light, have fun, but, bring it home safe.



OVERCOMING “GET-HOME-ITIS”

Lt Col Henry A. King III
HQ SAC/DOWAS

Oh, yes, it's spring again and time to brush up on this season's weather challenge. We know you are going to get hit from all sides with briefings from weather people and flying safety people on the horrors of flying in thunderstorms. We also know that some of you will contract "get homeitis," ignore these briefings and take chances. We know this because each year the statistics indicate that you did. We know this because each year someone will get trapped in a thunderstorm; occasionally they don't come back. We know this because each year lightning strikes account for the largest number of MISHAP cases and that most of these will be judged PILOT ERROR. So much for the Grim Reaper – this article is dedicated to those who enjoy family life and like to save the federal budget from the burden of replacing crews and aircraft. Let's begin with a discussion of the thunderstorm . . . what is it and how does it work.

First, a thunderstorm and a cumulonimbus are one and the same. Actually, cumulonimbus is the cloud associated with the thunderstorm but for your purposes, they are synonymous. By military definition, the thunderstorm is always associated with turbulence, hail, lightning, and low level wind shear; deadly foes for any aircraft. Thunderstorms are also associated with most every other weather condition known: snow, rain, icing, tornadoes, gusty winds, etc. There are approximately 44,000 of these storms occurring every day . . . that is 16,000,000 on the earth each year. You must expect to encounter some of these storms in flight and you should understand what you are up against.

Thunderstorms typically develop in unstable, moist air. That is, air which wants to turn itself over. Low level air which is lighter wants to rise, usually because it has been heated by sunshine on the earth. High level air which is cold and dry is heavy; it wants to sink. All that is needed to set this in motion is a trigger.

As the warm air rises, it encounters lower atmospheric pressure and expands. The laws of physics tell us that this expansion will result in cooling and that

cool air cannot hold as much water vapor as can hot air. Because of this, droplets begin to form. This is typically called the cumulus stage (Fig 1). As the water vapor, a gas, condenses to form a liquid, heat is released into the air, causing it to be even lighter and to rise faster. If the temperature is cold enough to have ice crystals form instead of water, even more heat is released so the rising air speeds up when the cloud starts to form and speeds up faster when the air reaches the freezing level. This action causes more air to be sucked into the base of the clouds to sustain the cloud building process . . . and strong updrafts occur.

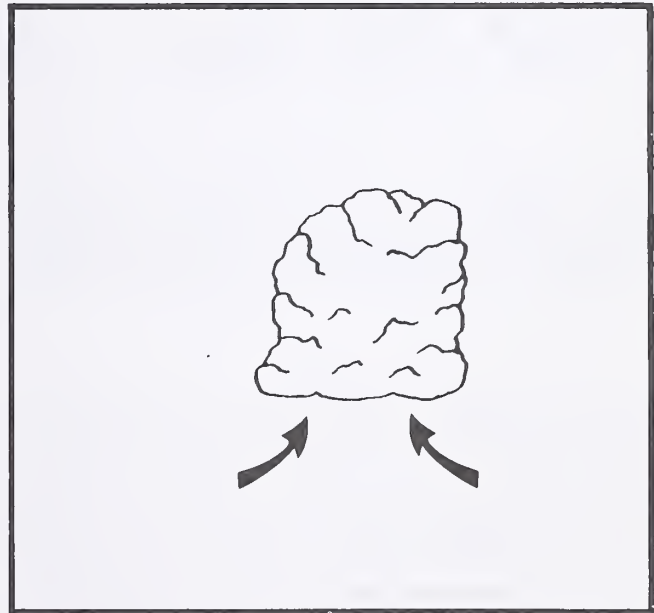


FIGURE 1 – Cumulus Stage. Warm moist air is sucked into the cloud base (arrows). Expansion cooling leads to condensation and cloud formation.

Continued

As the mixture of cloud droplets or ice crystals grows larger, large droplets and crystals collide with smaller ones and grow faster. Eventually the drop or crystal gets so heavy that the rising air cannot support them so they start to fall. As they grow larger they collide with and collect more small drops and crystals and grow faster. The larger they are, the faster they fall. The falling drops and crystals cause the air they are falling into to go downward due to frictional drag. The faster they fall, the faster the air currents go downward. At this stage, *the mature stage*, of the thunderstorm, you have upward motion and downward motion usually right next to each other (Fig 2). This causes turbulence.

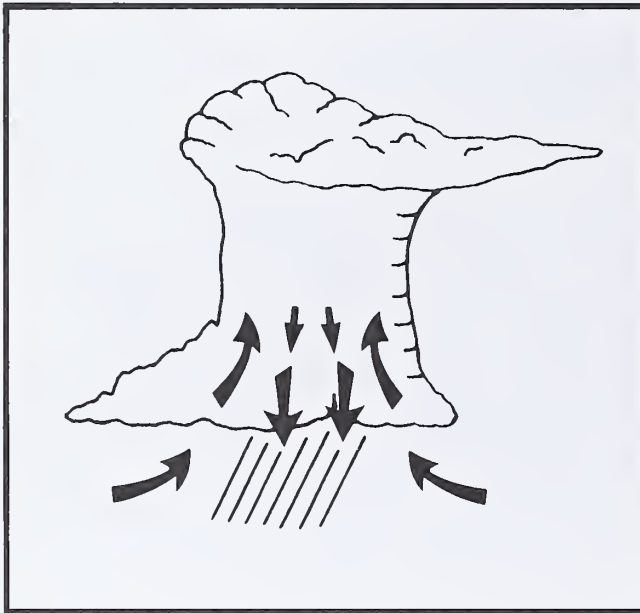


FIGURE 2 – Mature Stage. Warm moist air continues to rise, adding water to the cloud. Falling droplets and crystals create downdrafts by frictional drag. Rain develops in the area of downdrafts.

Now we reach the point that rain or snow falls out of the cloud base into an area with lower relative humidity. Since the air is no longer saturated, the droplets or snowflakes start to evaporate and this absorbs heat from the air they are in. The result is that the air below the storm cools off. This cool dryer air is heavier than the warm moist air surrounding it so it falls faster. Rain hits the ground below the storm and cools it off. Also, the down-rushing air hits the ground and moves outward in all directions somewhat like a wave caused by a rock thrown into a quiet pool of water. The leading edge of the outward moving air is somewhat circular and it acts much like a mini cold front. We call these gust fronts or outflow boundaries. For awhile, these boundaries force more hot moist air to rise, but finally they move so far from the base of the cloud that they

cut off the flow of warm air into the storm and it will die (Fig 3, dissipating stage). The gust fronts are associated with strong upward motion on the side away from the parent storm and strong downward motion on the side closest to it. There are also strong changes in the horizontal wind directions. These are the source of some of our worst cases of low level wind shear. What makes this even worse is that the gust fronts can continue to move away from the parent storm long after that storm dies and frequently there are no clouds to help you see them. This can cause much havoc when you're low and slow; the very time you can least afford it.

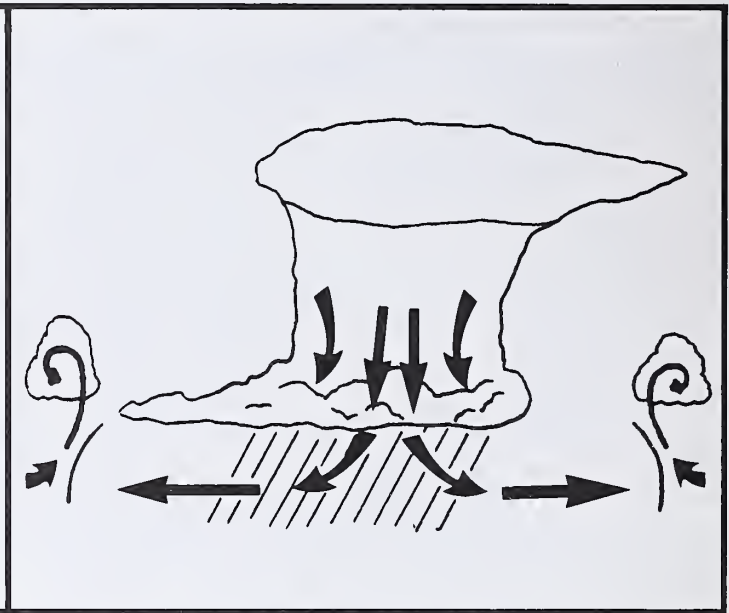


FIGURE 3 – Dissipating Stage. Rain spreads over cloud base. Ground below the thunderstorm is cooled, cutting off the updrafts. Entire storm is composed of downdrafts. Outflow boundaries/gust fronts develop.

As these gust fronts continue to expand outward, they force the air they hit to rise and this sets up the action for the next thunderstorm or series of thunderstorms (Fig 4). There is a greater upward push of the air in this second generation of storms than there was with the first; these storms can be expected to be more intense. Also, when two gust fronts collide, the upward vertical motion which results is significantly greater and the probability of the next thunderstorm developing here is much greater. The storm which develops will be much more intense than either of its parent storms. This is why it is so dangerous to try flying between two thunderstorms . . . you are right where the third one is going to build and the speed of development can be frighteningly fast. *Vertical development of a thunderstorm may exceed 6000 feet per minute.* Sometimes,

these gust fronts create lines of thunderstorms which move outward together. These are the squall lines you have heard about so frequently and should be avoided at all costs.

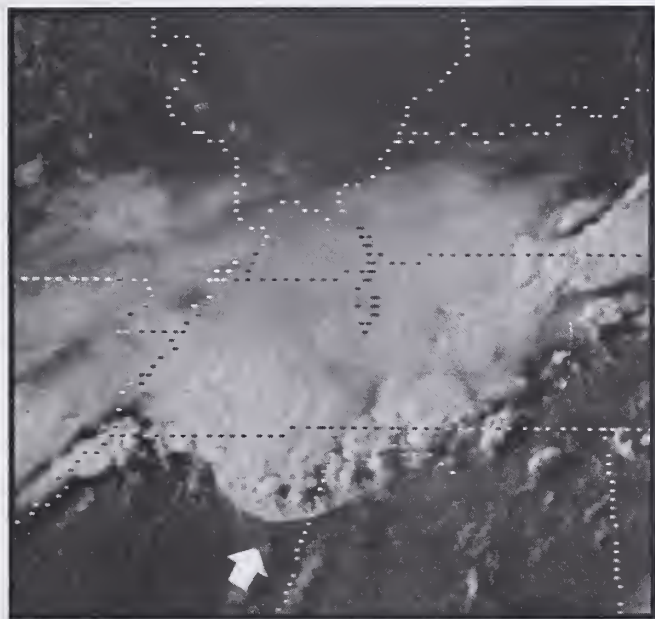


FIGURE 4 – Outflow boundary or gust front (see arrow) moves south from thunderstorms in Tennessee. New thunderstorms develop in Mississippi and Alabama.

Now that we have been through the life cycle of a thunderstorm, it is appropriate to discuss some of the weather events. Hail develops in thunderstorms which have strong updrafts. Large water droplets are carried far above the freezing level and freeze. The ice balls collect small water droplets and ice crystals until they get so heavy they can fall out of the updraft or they get thrown out of the side and top of the cloud, a good reason not to fly close to the sides and tops of these storms. As they fall into warmer air, they will melt but some will fall back into the updrafts below and get carried upward again. If there are real strong updrafts, this cycle can go on and on until we get giant hailstones which fall beneath the storm, a good reason to not fly under a thunderstorm. As with the water drops and ice crystals, the larger they are, the faster they fall and the greater frictional drag they put on the air they are falling into. This sometimes results in downdrafts so severe that no aircraft can survive them. We call these downdrafts, another good reason to avoid flying under a thunderstorm.

Lightning is another hazard to flying aircraft. We have all seen lightning . . . cloud-to-ground and cloud-to-cloud. Many of you have seen cloud-to-aircraft-to-ground and this can be very disconcerting. The pilot may be blinded, the radome may shatter, the aircraft may get a hole in it, the electronic gear on board may

get destroyed, or the fuel tank may explode. These events happen independently or collectively several times each year. We know that lightning strikes occur inside the clouds and under the clouds. We also know that they occur in the cloud-free area around the storms but we do not know how far from the cloud edge this occurs, another good reason to avoid flying NEAR a thunderstorm.

We have already talked of wind shear and turbulence so let's go on to one more hazard . . . icing. Icing is not the problem it once was because of the super deicing equipment on most aircraft. But in thunderstorms, icing can build up faster than the deicing equipment is capable of handling it. When the air is unstable, we know that liquid water can exist at temperatures far below freezing. We also know that when the liquid droplet is disturbed, such as on contact with a below freezing aircraft skin, it will instantaneously turn to clear ice. If flying in a thunderstorm at high levels, you are most likely to need your deicing equipment. If you are lucky, it will melt the ice faster than it forms; if you are unlucky you may fall faster than . . .

Now that you can properly appreciate the thunderstorm, let's discuss what you need to do to avoid the dangers. Naturally, you start at the weather station. Get the forecaster to brief you on the potential for thunderstorms in your area. Get the forecaster to give you the whole story in detail – where is the activity likely to start? When? How severe? Is it likely to spread? Find out when the activity will be worst so that you can plan for alternate routes or activities. Be sure to update your briefing before departure. And, of course, review the Dash One for proper procedures while flying inside a thunderstorm, just in case.

Once you are airborne, pay attention to the clues. If you see large, lumpy cumulus or even CB activity, you should consider using PMSV to update your briefing, be sure to pass a PIREP . . . it may help crews departing behind you. Avoid the thunderstorm if at all possible.

Use your radar to avoid areas of thunderstorms, not to pick your way around them. If you should suddenly find yourself unavoidably in the grips of a thunderstorm, use your radar to find the best way out, but beware. Use it to try avoiding the brightest echo regions but also, be wary of echo free regions or regions where echos appear to be much less intense than surrounding areas. Large water droplets and hail have a nasty habit of attenuating the radar and giving the appearance of being less intense. In reality, you may be flying into the worst downdraft of the entire storm.

One more time: When confronted by a thunderstorm the best method to confront the storm is to make a 180-degree turn, light the afterburner if available, and boogie out of harm's way.

We hope to see you next year.



MINUTEMAN OPERATIONS MANUALS: THE CHANGE PROCESS

BY MAJ WILLIAM R. HODGE
3901st SMES, VANDENBERG AFB

"Not another TO change!" has become a familiar lament over the past 24 months as Minuteman crew members have been inundated with a seemingly endless flow of new information and procedures. Due to several weapon system upgrade programs, including the recently installed ground maintenance status response system, the Minuteman Power Processor and AFSATCOM and 616A C3 systems, Minuteman operations technical data has undergone an unusually large number of changes. At the same time, the quality of operations technical data has been under careful scrutiny by Headquarters SAC and the 3901st Strategic Missile Evaluation Squad-

ron (SMES). The goal of this close scrutiny is to insure that the tech order is the best possible product available for its purpose. This goal can only be accomplished with the help of the primary user — the crew member. As the most important link in the improvement chain, the Minuteman crew member has indeed been actively submitting improvement reports. However, the average crew member is probably unfamiliar with what happens to his submission once it leaves the unit and how it ultimately becomes a part of his tech data. The following synopsis of how recommended changes to the tech data are processed will hopefully shed some light on this topic.

The change process for USAF technical orders is governed by two publications: (1) TO 00-5-1, AF Technical Order System, and (2) TO 00-5-2, Technical Order Distribution System. These TOs and their accompanying supplements spell out guidelines for submitting recommended changes to existing TOs. The crew member complies with these guidelines when he uses the AFTO Form 22, Technical Order System Publication Report and Reply, to submit his recommendations for improving his operations manual. The AFTO 22 is completed in accordance with TO 00-5-1 and is submitted to the unit Standardization Evaluation Division. If the recommendation is ap-

COMBAT CREW

proved at this level, it is then forwarded to the 3901st SMES for review and approval. As the SAC approval authority for ICBM tech orders, the 3901st SMES processes and reviews the AFTO Forms 22 by weapon system. Within the 3901st SMES, the Minuteman operations tech order section is manned by three TO monitors who are each responsible for a different weapon system – CDB, ILCS/SSAS, and MMII. As the Minuteman Tech Order Management Agency, Air Force Logistics Command (AFLC) has provided Vandenberg AFB with a permanent Tech Order Support Unit (TOSU). The primary function of this assigned TOSU is to implement, manage and control the TO quality assurance program. The 3901st SMES TO monitors work in close coordination with this TOSU to insure an expeditious and efficient distribution of time sensitive tech data.

Upon receipt of an improvement report from a unit's Standardization Evaluation Division, the appropriate TO monitor will do one of three things: approve it as written, change it to the extent necessary to meet military TO specifications, or disapprove it. In considering each of these options, the report is carefully researched and then coordinated with the other Minuteman weapon system TO monitors for their inputs and to determine possible application to the other Minuteman weapon systems. Occasionally, a report will require an engineering study to verify technical accuracy. If so, it will be forwarded to the engineering test facility at Hill AFB, Utah, for evaluation prior to making an approval/disapproval decision. In all cases, the individual originating the report will be notified of its pending implementation or its disapproval.

Once an AFTO 22 has been approved by the 3901st SMES TO monitors, they will decide which one of three submission categories will be used to incorporate the rec-

ommended improvement. In accordance with TO 00-5-1 these categories are emergency, urgent and routine. If it is categorized as an emergency change, the improvement report will be implemented via cryptographic message within 48 hours after coordination between 3901st SMES and the appropriate AFLC Management Agency at Hill AFB, Utah.

Urgent and routine reports involve more detailed processing. Urgent reports for Minuteman tech data are implemented by having the Vandenberg AFB TOSU print and issue a Technical Order Field Change Notice (TOFCN). This TOFCN is normally distributed as a "green page," better known to the crew members as a "VB" which means it was issued by the Vandenberg AFB TOSU. All TOFCNs are subsequently re-issued within 40 days as a "white page" in the next formal change or Tech Order Change Notice (TOCN). Sometimes, TOFCNs are issued as "pink pages." These pink pages are normally issued by the contractor in conjunction with a scheduled equipment modification to cover the equipment configuration both before and after the subject modification is completed. Subsequently, when the modification has been completed, these pink TOFCNs are re-issued as a formal white page TOCN.

Routine reports, on the other hand, are implemented only through the formal, white page TOCN. Once the 3901st SMES determines an approved change report is routine, it is forwarded through the Vandenberg AFB TOSU to the appropriate AFLC agency at Hill AFB. There the report will again be reviewed for technical accuracy and conformance to military TO specifications. At this point the change is sent by AFLC to an independent, contract printer who reproduces and ships the change to the unit. In accordance with TO

00-5-1, 240 days are allowed for routine changes to be implemented in this manner.

To further insure operations tech orders are accurate and reliable before authorizing their use, the 3901st SMES reviews all formal TOCNs immediately upon receipt from the contract printer and works with the TOSU to insure any errors are corrected prior to issuance of the change. In many cases the units will receive the formal change from the printer several weeks before the 3901st SMES; this is because the printer is not required to insure all recipients receive the change at the same time. Upon receipt at the unit, a TOCN may not be formally posted to the TO until the Index Sheet or "blue page" is issued. To insure any printing errors are corrected before implementation, the Vandenberg AFB TOSU normally releases the Index Sheet to the unit only after the 3901st SMES TO monitors have completed their review of the TOCN. This procedure also allows the units time to review the TOCN to access impact and to develop required training materials and lesson plans. If significant errors are found by either the 3901st SMES or the unit, an urgent change VB is issued along with the Index Sheet correcting the errors. We have found this process to be the most efficient for insuring that the crew member ends up with a viable product.

We have strived here to offer the crew member an insight into how the continuously changing content of his tech data is managed and the vital role he plays in this process through his submission of improvement reports. Only through his concern and active involvement can we insure the highest quality tech data possible.





SAFE . . .

OR OUT!

Capt Charles D. Lambert
44 SMW, Ellsworth AFB

Although my full time job is wing missile safety officer, I moonlight rather frequently as a referee for various sports around base and town. It struck me the other day how similar the two jobs are, and how much each prepares me for the other.

Safety has its three "Es": Engineering, Education and Enforcement; so do the various sports to an extent. Safety engineering is a minor aspect of my daily duties as a safety officer. Material Deficiency Reports and AFTO Form 22's are submitted and recommendations are made, but depot and contractor personnel perform most of the safety engineering function. Sports are similar. The referee does very little "engineering," however he may make recommendations to the appropriate governing body for changes to the rules, equipment, etc.

Education gets more involved for both jobs. As safety officer, I check the quality of safety train-

ing programs to insure all personnel are adequately trained on safety and the mishap prevention program. Even on inspections, I find myself having to explain the reasoning behind safety rules and the possible consequences of not following them. As a referee, I really have no responsibility to educate coaches or players, however, I constantly find myself in the position of having to educate others. New referees read and learn the rules on their own, but the experienced referees must pass on the benefit of their experience to new referees for them to be truly effective. On a more frequent and recurring scale, I am called upon to educate players and coaches. Nothing requires them to know the rules but they must abide by them. Sports rules, like a lot of our Air Force rules, change over time, however, most coaches and players will insist that rules they used in high school or college are still valid. On almost a nightly basis, I have to explain to an irate player or coach that it doesn't matter which way a player turns after he passes first base, or that the three second rule in basketball is not what everyone thinks it is. Players are always coming up with rules that they thought were in the rule book and I, as a patient, understanding referee take the time to explain or clarify the rule for them.

Then there's enforcement, the main job of the referee and seemingly so for any safety officer. Inspections and evaluations seem to be the bread and butter of the safety officer, enforcing the myriad of safety regulations and standards. The referee and the safety officer run into the same problems when enforcing the rules, namely a problem with lack of knowledge concerning the rules and a chance-taking attitude which demands enforcement of the rules.

Not knowing the rules of the game is a simple problem to resolve. For the referee, a simple safe or out call or sounding of the whistle, with a later explanation to the player or coach usually clarifies any doubts in anyone's mind. Safety is similar. If the non-compliance with a safety rule is a genuine case of "I didn't know," then chances are it won't happen again, particularly if an inspection report is sent to the unit commander so he can get the word out to all the troops.

The bigger problem is with the people whose attitude allows them to take chances. Again, the comparison between safety and sports can be made. The person who tries to stretch a good solid single into a double is not much different from the technician who takes shortcuts in maintenance. Both are taking a chance and betting they don't get caught. It is here that the similarities between safety and sports end. The sports player may take the risk and the worst that can happen is that he will be called for a violation of the rules by the referee. Sure, it may cost the team points or even the game, but in the player's mind, the risk being taken is worth it. After all, the risk is for the good of the team. Taking such chances are as much a part of sports as the national anthem. The player who gets thrown out sliding into second on a close play will usually get praised by the coach for a "good try."

Safety, on the other hand, offers no room for chance taking. Sure, it happens. Personnel skip steps in the technical order or don't use their personnel protective equipment, all in the name of saving time or trouble. When they do this, they are making a double bet: (1) They won't get caught by safety, quality con-

trol inspectors, or supervisory personnel, and (2) Their actions will not result in personnel injury or equipment damage. Maybe in the technician's mind, the chance is worth taking, but, like the ball player, eventually he will get caught. Commanders and supervisors are not like coaches when it comes to risk taking. No technician will ever be told "good try." In fact, "goodbye" may be the only words heard.

The consequences of risk taking can be extreme, ranging from damaged/destroyed equipment to loss of life or limb. This alone dictates the need for a strong, effective mishap prevention program. Personnel must be aware that while sports tolerates both safe and out calls, the Air Force can only tolerate one call ... **SAFE.**



WEATHER AVOIDANCE

Major Colin J. Crim
1CEVG, Barksdale AFB

BIG I

As the pleasant months of summer approach, and we begin to encounter the unsettled conditions of spring, it is time once again to say a few words about thunderstorms and weather avoidance. In past articles we have discussed many aspects of weather avoidance including the basic ground rules for SAC pilots found in AFR 60-16 and the SAC Sup 1, the use and limitations of airborne radar for weather avoidance, and the availability and limitations of ATC assistance in avoiding weather. In this article we will briefly mention some points to keep in mind when the weather is threatening and then discuss a newly identified phenomenon of great interest to aircrews.

Effective weather avoidance begins well before the aircraft is airborne. In fact, in some instances, effective weather decisions can be made during mission planning even when it is accomplished the day prior to the flight. When planning a training sortie, we sometimes have a choice of routing to or from an A/R track or other scheduled activity. We can often choose one of several directions when we plan our celestial navigation training legs. A careful analysis of the weather data and fore-

casts available the day prior to the flight could indicate, with various degrees of accuracy, the locations during the flight of fronts likely to produce thunderstorms. The forecast frontal thunderstorms may not appear as or where expected, and precise locations of air mass thunderstorms are almost impossible to predict; but if you remember to check with weather during mission planning you'll have some idea of what to expect during the flight and can plan accordingly. Even if you guess wrong on a few occasions, your batting average should be better than if you never checked at all.

Take another good look at the weather during your pre-mission weather briefing. Pay attention to the briefer, study the charts, and ask questions. Study the latest satellite photos and the radar, summary charts, but remember that the information is already old when you look at it. These photos and charts are a reliable indication of where the storms have been developing, but the storm locations and intensities can change considerably before you get your flying machine airborne. At any rate, a thorough study of all the available in-



formation will better prepare you to make more effective decisions when you encounter the weather aloft. With weather in the local area, don't forget to have a look at the station's weather radar before you depart base operations.

Other pre-flight activities can also help to ensure a trouble free flight. When weather threatens, spend a little extra time during your preflight checking out your radar. Use the radar or contact Metro prior to takeoff to check your departure route. If you need different routing due to weather you should request it as soon as possible. By watching the weather and its movement you can determine when it's best, or necessary, to wait on the ground for conditions to improve.

The aircraft radar can also be your most effective airborne tool for avoiding weather, but when you use it, as most of us do, to fly through breaks in lines of thunderstorms or pick our way around individual cells you should remember some of the radar's inherent limitations. Radar depicts only precipitation, and therefore will not show areas of turbulence, protect you from lightning strikes, or help you avoid hail damage well downwind of a cell. Heavy precipitation greatly attenuates radar radiation so that a strong cell can effectively hide from view what lies behind.

The preceding paragraphs have addressed some aspects of avoiding the thunderstorms which we commonly classify as either frontal or air mass in origin. We consider these typical cells to be either organized in narrow lines or scattered randomly within a given area. Pilots can avoid these storms by finding breaks in the lines, making an end run around a line, waiting on the ground for a cell or line to pass by, or by picking his way around the individual cells. These techniques will not work for all types of thunderstorm activity, as we shall soon see.

Meteorologists have recently recognized the existence of large thunderstorm systems called Mesoscale Convective Complexes. First described by R. A. Maddox and J. M. Fritsch, the Mesoscale Convective Complex (MCC) develops rapidly over a very large area, moves slowly, and often persists for more than 12 hours. MCC's are typically round or elliptical in shape and contain very intense central thunderstorm activity. MCC's produce the usual thunderstorm conditions and hazards, but their large size, sometimes covering portions of several states, and long duration can create serious problems for pilots. The pilot whose destination is in or near an MCC must be aware that conditions at that destination may be very slow to improve. During an MCC that affected the Gulf

States, Jackson, Mississippi, experienced a thunderstorm which lasted continuously for nine hours. Also, the MCC may be too large to easily circumnavigate.

Circumnavigation can also be made more difficult by changes in the normal pattern of the winds aloft. The MCC releases enough energy to significantly alter the winds at cruising flight levels. Winds southwest of the system are greatly reduced, while the winds north of the system are dramatically increased. A pronounced jet of high-speed outflow forms along and downwind of the northern part of the system. Wind speeds 60 Kts greater than the prevailing flight level winds have been observed. These winds can be accompanied by moderate to severe CAT. As the formation of MCC's cannot yet be accurately predicted, these wind modifications are not reflected in available forecasts.

MCC's pose tough problems for forecasters as well. MCC's can develop rapidly within areas of favorable flying conditions. Within a very few hours, a few air mass type storms can grow into a very large system. Mesoscale Convective Complexes are most common in the central U.S., but they have occurred in other portions of the country as well. Forecasting the onset of an MCC involves the recognition of a complex pattern and involves the analysis of many factors including pressure patterns, winds aloft, and movement of upper air disturbances. Available analysis products may not have sufficient detail to permit the easy forecasting of MCC's. Because the large complexes so significantly alter the surrounding environment, it is also very difficult to predict the movement and behavior of a system once it has developed.

MCC's have the potential to substantially impact and disrupt flight operations. Because these systems have not been previously well recognized and publicized within our aviation community, it is time to begin an educational process. Only by developing a general recognition of the significance and effects of MCC's can we hope to minimize their effects on our aviation operations.

This article only begins to scratch the surface of this very complex subject. You might suggest that the OIC of your AIRC include information on MCC's in the course, or consider requesting a presentation by the base weather shop at your next flying safety meeting. Some literature is also available and your weather shop should be able to help you here as well. If you have further questions on this or other instrument areas feel free to contact Majors Cooper, Crim or Holland at AV 781-3648.

After being assigned to my new base and crew, we were immediately tasked on short notice to support a refueling mission out of Hickam. As an eager new KC-135 navigator, I was very excited about the upcoming trip. Since there was a very short time to prepare for the mission, we basically picked up the appropriate charts and forms the afternoon before the flight with nothing more than a thirty minute briefing. Being unaware of the specific mission requirements, I did not realize that our landing time in Hickam had to be after 0800 local time because of noise abatement problems. Therefore, we took off out of our departure base so as to arrive no earlier than this. The take off and departure were on time and uneventful.

As far as the navigation, all equipment appeared to be working good, even the old doppler. The celestial was good and I took several three star fixes. The celestial information looked very good and agreed with my D.R.'s and the ground position indicator. Then a great problem arose, after completing my final night precomp for our last celestial observation prior to the ADIZ. I gave the boom operator the information for the first star and he immediately stated that he could not see the star due to twilight. I was very confused. There I was, no star information available, the sun had not risen, and we were quickly approaching the ADIZ.

Well, I thought, I will simply use a planet LOP. Looking in the air almanac, I began a precomp for Venus, and guess what, the body

was not available. I found out the same for Mars, the second body in the air almanac. By the time I had attempted these precomps, the copilot told me the TACAN had locked on and immediately took a fix. Even though we were relatively close to where I thought we were, I had learned an important lesson on how much of a problem twilight can be.

After returning home, I asked around to see if anyone else had a solution to the twilight problem. One of the senior navigators said he did and would show me how to alleviate this. He pulled out the air almanac and turned to the rising, setting and depression graphs and proceeded to show his solution. For this example, I used 5JAN83, FL350, and a computer flight plan from my current base. From the flight plan, I used the overwater reporting points, a takeoff time of 1230Z, and a ETA of 1803Z to Hickam. I then calculated from the graphs the time of sunrise and the time for the beginning of civil twilight at each of the reporting points. After these calculations were made, I then constructed a graph using the longitude on the horizontal axis and time on the vertical axis. The resulting graph approximates a linear function, and would be linear if our true course was due west in our scenario. After plotting the points for both sunrise and beginning of twilight, I drew a straight line, coming as close to all of the points as possible. The route of flight should then be drawn in the same manner, by plotting your arrival time at each reporting point. Where the track line crosses the beginning of the twilight line, is the



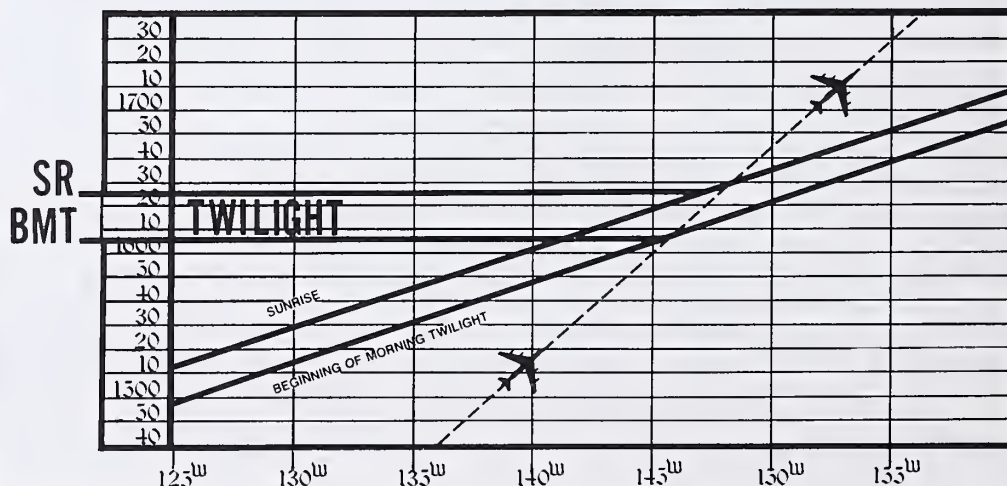
ROUTE OF
FLIGHT

SR _____

SUNRISE

BMT _____

BEGINNING OF
MORNING TWILIGHT





DEALING WITH TWILIGHT

time you will be in twilight conditions. Similarly, the same is true for the sunrise line. From this example, we can see we are in twilight conditions from 1609Z until 1626Z. If you are early or late then draw a new track line and this will give you new times for twilight conditions. Since the time of sunrise and twilight change slowly, this graph should be good for two or three days, in the event the sortie is postponed. Remember these times are approximate. To be conservative, you should probably use a five-minute period on either side of your twilight times to make sure you have nighttime or daylight conditions.

Another solution to twilight is the use of the "Eyeball" precomp. By simple observation of your air almanac page, you can determine which bodies are available at any time. Let's take our scenario and choose a time during twilight. For example, at 1610Z, our aircraft longitude is about 146° W longitude. We would then add and subtract 80° to 146° , resulting in a range of 066° to 226° . Looking at the air almanac page for 5JAN83, see if any of the GHA's of the planets or the moon fall within this range. Our example would show that Jupiter (GHA 107-02) and the moon (GHA 147-03)

both will be available for observation. This "Eyeball" precomp works at any longitude. If the longitude is east, first subtract from 360° to get your base number before adding or subtracting the 80° . Also, the smaller the GHA the more easterly the body falls. For example, Jupiter, with a GHA of 107-02, has a ZN of 134.7 and the moon, with a GHA of 147-07, has a ZN of 203.0.

These techniques give you two solutions to the twilight problem and when used together, make twilight navigation very simple. Remember, after constructing the graph it can be adjusted for a late takeoff and is normally good for a two or three day period. You can also construct the same graph for twilight conditions at nighttime. I know this works because on my next TDY, to England, I constructed the graph and it worked perfectly. I knew exactly when I would have twilight conditions. Therefore, I adjusted my pacing to obtain a night position and then a day position after sunrise, with no degrade of celestial information. It works, is accurate, and I recommend trying these techniques on your next overwater flight. Good luck!



Missile Maintenance

SSgt Robert M. Tull, Jr., 394th ICBM Test Maintenance Squadron, Vandenberg AFB, is SAC ICBM Maintenance Airman of the Month. SSgt Tull was selected to fill the position of NCOIC, MK-12 Reentry System Maintenance Shop after a six-year separation from the Nuclear Weapons career field. In this capacity, he displayed superior abilities in planning, scheduling and monitoring the daily, weekly, and monthly maintenance effort as well as participating in three HQ SAC Operational Test Launches. At the same time, he maintained an error-free maintenance documentation program, and converted an unsatisfactory shelf life program into one commended by the HQ SAC IG as outstanding.



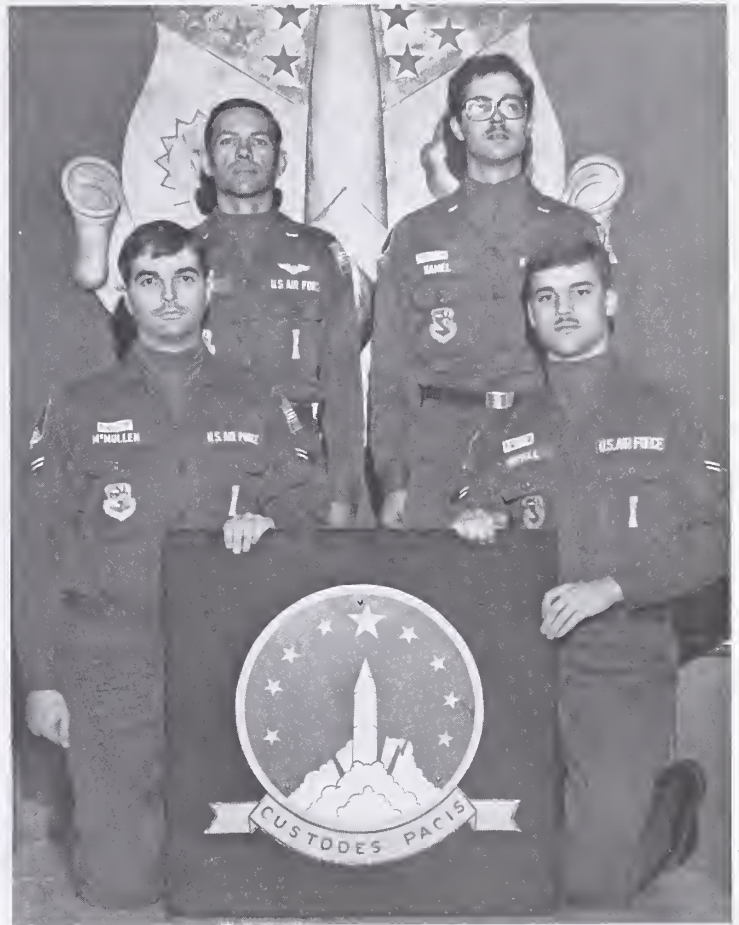
Aircraft Maintenance

SSgt Richard L. Skrable, 509th Munitions Maintenance Squadron, Pease AFB, is SAC Maintenance Airman of the Month. Sgt Skrable has demonstrated exceptional technical ability, leadership and initiative in his duties as aircraft integrated systems checkout team chief. His experience and expertise of the aircraft integrated systems were the main reasons for the success of his section's in-shop training program. Sgt Skrable was chosen to supervise the Munitions Services Branch system checkout team during Red Flag 82-4 and his efforts during the 1982 SAC Bomb Comp resulted in perfect operating weapons release systems on all three competing B-52 aircraft throughout the six-week preparation and competition period.

PROFESSIONAL PERFORMERS

Missile Crew

The 308th SMW, Crew R-011: 1Lt Albert Hamel, MCCC; 1Lt Larry Johnson, DMCCC; A1C Patrick McMullen, MSAT; and A1C Mike Russell, MFT, is SAC Missile Crew of the Month. In three separate alert tours recently, Crew R-011 demonstrated their professional demeanor, superior weapon system expertise and exceptional missile safety knowledge. During a major accident response exercise initiated for a SAC ORI the SAC IG rated the crew's performance as "excellent" and characterized their control of the situation as "superior." During another alert tour, Crew R-011's prompt performance of proper partial shutdown procedures of the propellant hazard sensing equipment saved 400-500 man-hours that would have been required for missile wipe down, engine oil change, and ground isolation check. On a third tour, the BMAT and MFT performed the correct equipment shutdown procedure which eliminated a hazardous condition and prevented extensive damage to critical cooling system components.

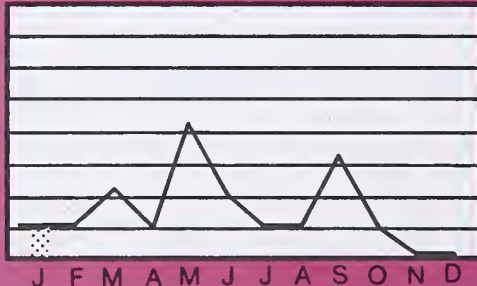
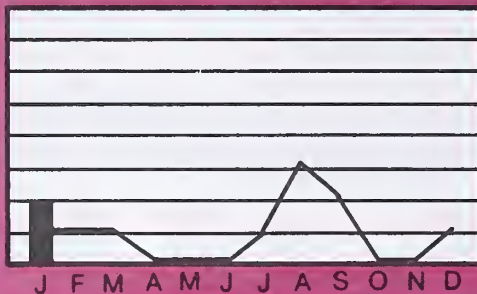
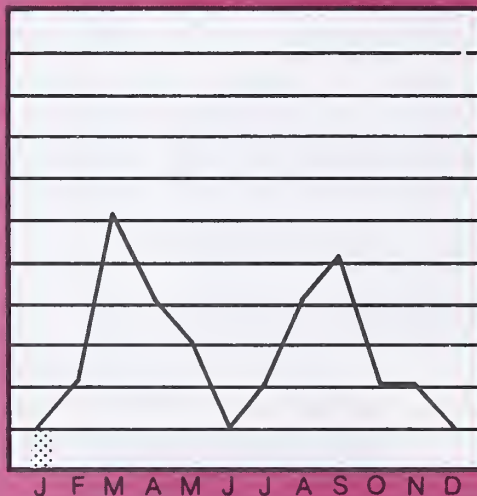


Flying Crew

Capt Ronald Cavendish, P; 1Lt Frank Boyle, CP; Capt Ronald Nass, INB; 1Lt James Gray, NN; 1Lt Michael Conner, NE; TSgt Ronald Wright, IAG; and 1Lt Gerald Valentini, INN, 19th BMW, demonstrated extraordinary aerial achievement by aiding the recovery of a B-52G aircraft experiencing complete loss of rudder and elevator control. The mission had called for air refueling, low and high altitude bomb runs, and a navigational leg. After departing the low level, complete loss of one main rudder elevator hydraulic system occurred. Realizing their problem Crew E-21 headed for home base. The inevitable happened, however, as the remaining rudder elevator hydraulic system failed. Faced with accomplishing something that had never before been successfully achieved in a B-52, the crew rallied together. Knowing the odds for safe recovery, the crew was given the opportunity to bail out. Their decision to remain with the aircraft as an integral crew was a factor in the successful recovery. Communication, checklist accomplishment, altitude and airspeed crosscheck, and interphone discipline inherent in crew coordination were expertly accomplished. The end result was the recovery of this valuable resource with minimal damage in the finest display of crew professionalism.

"For The Want Of The Nail"

1983

Space & Missile Mishap Experience**TITAN****AIR LAUNCH MISSILE****MINUTEMAN**PERSONNEL
ERROR NON PERSONNEL
ERROR TOTAL MISHAPS
1982

The many minor discrepancies (dirty floors, missing washers, bolts sheared off, dust caps missing, broken lanyards, etc.) are commonly laughed off as being "picky" writeups. However, this attitude, according to the story, endangered the entire army: "For the want of the nail loseth the shoe." Although we or our superiors, peers, or subordinates consider one missing bolt or nut as insignificant, that particular piece of equipment was designed/tested/bought and installed with that bolt and nut. Insignificant? No. That bolt or nut is necessary. If it is missing, it causes a lot of questions (especially if it is on a nuclear certified piece of equipment). Is it sabotage? Lack of supervision? Lack of personal integrity? Excessive vibration? Or perhaps the most important question: Where is it? On the flight line; inside the missile; in the aircraft engine? Attention to detail, fixing the little stuff, is extremely costly. Thousands, perhaps millions, of dollars a year are wasted in having to fix the vast amount of missile and aircraft related minor discrepancies which should have been detected/corrected by the initial maintenance team.

Of course, there is no solution to the problem. I strongly disagree. Personal integrity is the key. We as supervisors, whether junior or senior in rank, must set the example. We have some of the best young men and women that America has to offer. We provide them with a substantial living, excellent technical training, a fairly good duty assignment and then we set the double standard: Do it right when you are being inspected; or don't let us catch you doing that; or this ain't the right way but it's okay.

Integrity is developed through socialization, church, home, fraternities, job, etc. In many cases the airmen are with you from eight to sixteen hours a day and several days a week. Does your example contribute to his integrity development? Whether you admit it or not, your influence is tremendous. If you, through your actions, tell him that, "If the horse goes lame, we will get another horse," how can you expect him to replace the missing nail?



SAC'S TEN YEAR FLYING SAFETY RECORD

CLASS A FLIGHT MISHAPS

YEAR

TOTAL
MISHAPS

FLYING HOURS
100,000

FATALITIES

RATE

73	74	75	76	77	78	79	80	81	82
5	7	4	4	4	1	5	4	4	2
6.1	5.1	4.2	3.9	3.7	3.6	3.6	3.4	3.5	2.9
0	14	7	22	10	5	7	2	14	9
0.82	1.58	0.96	1.03	1.00	0.28	1.41	1.18	1.15	0.58

83
0
.26
0
0

8 AF

15 AF

26008

JAN FLYING HOURS

26008

1983 FLYING HOURS

1983 MISHAP STATS



SAC SAFETY SCREEN

These Warriors ... The Cutting
Edge of The National Resolve

97 AREFS, Blytheville Crew R-107: P Capt Gary P Moe, CP Capt James S Fowler,
N 2Lt Donald G Johnson, BO A1C Douglas Blake

340 BMS, Blytheville Crew R-14: P Capt Edward J Skees, CP Capt Michael C
Chatham, RN Capt James E Hoefler, N 1Lt Mark L Turner, EWO 2Lt Jeffrey W Kelley,
G A1C Russell R Young

340 BMS, Blytheville Crew R-21: P Capt Bruce M Nelson, CP Capt Dusty K
Kennemore, RN Capt Terence W Haynes, N 1Lt Jerry L Dillon, EWO 1Lt Herbert R
Zucker, G MSgt Michael L Kissell

509 AREFS, Pease Crew S-121: 1P Capt David W Roberts Jr, CP 1Lt Michael
O'Rourke, IN 1Lt Kim A High, IBO Sgt Richard A Radvanyi

509 AREFS, Pease Crew S-101: 1P Maj Paul M Breen, CP Capt James L Pen-
nekamp, IN Capt Randall S Foster, IBO TSgt Gary E Hutchison

393 BMS, Pease Crew R-27: AC Capt Brian A Arnold, NB Capt Donn M Lewis

41 AREFS, Griffiss Crew S-101: 1P Maj Thomas A Scherm, CP Capt Michael A
Kolodka, IN Capt Paul F Fitzpatrick, IBO TSgt Donald E Nickel Jr

19 BMW, Robins Crew S-101: 1P Capt Morris D Clary, CP 1Lt Robin P Needham,
IN Capt George B Wingard, IBO MSgt William H Jackson

19 BMW, Robins Crew E-111: FP Capt Michael P Miller, CP Capt Don A Keener,
IN Capt Michael W Cole, IBO SSgt Lance M Hornbuckle

19 BMW, Robins Crew E-11: FB Capt Donald W Hiebert, CP 1Lt Thomas C Lennep,
IRN Capt Terrence M Phillips, N 1Lt Matthew W Cervenak, EW 1Lt Bernard S Russell,
IG SSgt Major Carter

69 BMS, Loring Crew E-27: AC Capt John D Watson, CP Capt Albert Vacca Jr,
CP 2Lt David C Hassler, RN Capt Paul W Curtis, N 1Lt Stephen J Layton, EWO 1Lt
William E Law Jr, G A1C Brian S Taylor

42 AREFS, Loring Crew E-111: 1P Maj Barry R Levitz, CP 2Lt Deborah C Burge,
N 1Lt Roger C Chenoweth, BO SSgt Dale H Mitchell

407 AREFS, Loring Crew R-173: 1P Capt William G Rogers, P Capt John W
Schmick, CP Capt Kevin D Brown, N Capt Philip Q Pontier, BO Sgt Roger D Thomas

46 AREFS, K I Sawyer Crew R-115: P Capt Daniel A Agostini, CP 1Lt Benjamin
W Muetzel, N 1Lt Thomas M Hamilton, BO Sgt Judy L Burr

644 BMS, K I Sawyer Crew S-03: FP Capt Gerald J Venteicher, CP 1Lt Stephen
D Schmidt, RN Capt Mark R Thessing, NN 1Lt Stephen M Boykin, NE 1Lt Robby W
Morris, AG SSgt Glenn H Raasch

644 BMS, K I Sawyer Crew S-21: FP Maj Norwood A Hart, CP Capt Robert E
Wheelock, RN Capt James A McLaughlin, NN 2Lt Michael F Hayden, NE 1Lt John J
Morgan, AG SSgt Paul J Carstens

68 AREFG, Seymour Johnson Crew S-114: P Capt William Hunt, CP 1Lt Michael
Moore, N Capt David Milewski, BO Amn David Pileski

68 AREFG, Seymour Johnson Crew S-101: P Maj Thomas Baumgardner, CP 1Lt
Jeffery Franklin, N Maj Denneth Parsons, BO TSgt Robert Robertson

381 SMW, McConnell Crew E-195: MCCC 1Lt Carlos L Gallardo, DMCCC 2Lt
Sheila L Schrock, MSAT SrA Robert J Aeschke, MFT SrA Monty K Owens

390 SMW, Davis Monthan Crew E-052: MCCC 1Lt Albert D Castanon, DMCCC
1Lt Edmund G Memi, MSAT SSgt Lawrence J Wheeler, MFT Sgt David E Furce

90 SMW, F E Warren Crew R-033: MCCC Capt David M Riester, DMCCC 1Lt
George S Benson III

321 SMW, Grand Forks Crew R-062: MCCC 1Lt John M Wilson, DMCCC 2Lt
Steven B Baxter

44 SMW, Ellsworth Crew R-183: MCCC 1Lt Thomas A Theado, DMCCC 2Lt
Joseph Tripodi

351 SMW, Whiteman Crew E-032: MCCC 1Lt David J Ginsburg, DMCCC 1Lt
Joseph B Connell

HALL OF FAME

TACTICAL FLYING

OVER TWENTY-SEVEN YEARS

170 AREFG, McGuire (NJANG)..... Feb. '56

OVER TWENTY-FIVE YEARS

171 AREFW, Greater Pittsburgh (PAANG)..... Mar. '58

157 AREFG, Pease (NHANG)..... Jun '58

OVER TWENTY-THREE YEARS

940 AREFG, Mather (USAFR)..... May '59

307 AREFG, Travis..... Sept '59

OVER TWENTY-ONE YEARS

151 AREFG, Salt Lake City (UTANG)..... Feb '61

134 AREFG, McGhee Tyson (TNANG)..... Aug '61

11 SG, Fairford..... Feb '62

OVER TWENTY YEARS

340 AREFG, Altus..... Jun '62

96 BMW, Dyess..... Aug '62

OVER NINETEEN YEARS

19 BMW, Robins..... Aug '63

OVER EIGHTEEN YEARS

160 AREFG, Rickenbacker (OHANG)..... Dec '64

320 BMW, Mather..... Jul '65

OVER SIXTEEN YEARS

452 AREFW, March (USAFR)..... Sep '66

92 BMW, Fairchild..... Feb '67

OVER FIFTEEN YEARS

55 SRW, Offutt..... Jul '67

2 BMW, Barksdale..... Aug '67

5 BMW, Minot..... Feb '69

OVER THIRTEEN YEARS

42 BMW, Loring..... Sep '69

141 AREFW, Fairchild (WAANG)..... Oct '69

OVER TWELVE YEARS

28 BMW, Ellsworth..... May '70

OVER TEN YEARS

101 AREFW, Bangor (MEANG)..... Mar '72

306 SW, Mildenhall..... Apr '72

416 BMW, Griffiss..... May '72

305 AREFW, Grissom..... Aug '72

OVER NINE YEARS

379 BMW, Wurtsmith..... Apr '73

931 AREFG, Grissom (USAFR)..... Feb '74

OVER EIGHT YEARS

384 AREFW, McConnell..... Mar '74

189 AREFG, Little Rock (ARANG)..... May '74

43 SW, Andersen..... Dec '74

OVER SEVEN YEARS

68 AREFG, Seymour Johnson..... Sep '75

OVER FIVE YEARS

410 BMW, K.I. Sawyer..... Apr '77

190 AREFG Forbes (KSANG)..... Apr '77

128 AREFG Milwaukee (WIANG)..... Jul '77

ICBM

OVER EIGHTEEN YEARS

1 STRAD, Vandenberg..... Sep '64

OVER TWELVE YEARS

341 SMW, Malmstrom..... Apr '70

OVER NINE YEARS

390 SMW, Davis-Monthan..... Jul '73

OVER EIGHT YEARS

351 SMW, Whiteman..... Oct '74

91 SMW, Minot..... Nov '74

OVER SEVEN YEARS

321 SMW, Grand Forks..... Feb '76

To gain listing in the Hall of Fame, a SAC or ARF unit must be Class A mishap-free for 48 months.

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